Q. Mr. Turner contends that Verizon MA should have used the average of 3.83 nodes per SONET ring when developing the fixed component of IOF UNE rates. Is this contention correct?

A. No. Consistent with TELRIC principles, Verizon MA created a forward looking SONET ring architecture for its transport studies. Verizon engineering experts determined that a six node design was the appropriate model to best estimate the cost of this forward looking SONET architecture. Given the anticipated maximum practical loading of 48 DS3 circuits on this six node OC48 ring and the requirement of two ports per circuit (for a total of 96 ports on each ring), Verizon MA determined that each node would have 16 ports (representing 96 total ports divided by six nodes). Thus, contrary to Mr. Turner's contention, Verizon MA correctly calculated the total number of ports per SONET ring based on the forward-looking cost model of a *six* node SONET ring.

Q. Why did Verizon MA assume more nodes per SONET ring in its cost model than what is typically found in today's network?

A. The primary reason for assuming a larger number of nodes per ring is to properly balance costs of ADM utilization and the cost of interconnecting rings in a SONET network. Increasing the number of nodes on a SONET ring in turn increases the probability that a DS3 circuit can be created between two offices without having to use more than one ring. For example, if a network uses only four-node rings, it would be necessary to build many overlaying rings to connect offices in various four-node patterns. In turn, many DS3s would have to travel across two or more four-node rings to connect the particular points required by customers. Because ring interconnection is a major cost in a SONET network, reducing ring interconnection requirements generally helps reduce overall transport costs.

Larger rings also reduce the network's sensitivity to demand uncertainty, thus reducing the need for spare capacity and capacity "chasing" across multiple rings to make connections. When designing and planning IOF networks, it is extremely difficult to predict the precise point-to-point demand for IOF circuits. Because demand variability increases as the number of nodes on a ring decreases, the forecasting problem becomes more difficult as the number of offices served by a single ring decreases. Moreover, the engineers must examine each ring and determine whether exhaust is likely in the next forecast period for that ring. If there were fewer nodes and thus more rings, engineers would have to produce a much greater number of correct forecasts, and this, combined with the less predictable demand characteristics of smaller rings, likely would increase greatly the chance of reaching exhaust capacity on any ring. This would leave engineers with two choices: they would either have to provide greater amounts of spare capacity in each ring across the network or risk having to route DS3 circuits around multiple rings to avoid congested rings. Either option produces economically inefficient results.

The number of nodes per ring that Verizon MA could assume for a forward-looking model is limited by practical constraints, however. Any ring larger than three nodes requires careful planning and administration to achieve efficient fill, because the available capacity on a ring is limited by the peak load between any two adjacent nodes on the ring. This fact has, in the past, limited the average ring size in the network. However, Verizon determined that, based on the enhanced capabilities of the latest generation of SONET technology and operations, the cost of a forward-looking SONET transport network is best estimated by a model assuming six nodes per ring.

Q. Is it reasonable to change the number of nodes in the fixed component of the forward-looking model without changing any other parameters?

A. Most certainly not. As explained below, the ring interconnection factor would have to be changed, as well. If this change were made, the result would be to increase, not decrease, IOF costs. The number of nodes per ring directly determines two other critical parameters that impact costs in the SONET ring model: the anticipated number of DS3s that can be loaded on the ring and the average number of ring interconnections that each DS3 circuit experiences. As explained previously, constructing rings with fewer nodes creates more uncertainty in forecasting capacity requirements. An architecture that assumes four nodes per ring must have many more rings to connect the same set of nodes as a six-node architecture. The combination of fewer nodes per ring and more rings in the network increases the chance that a particular circuit will have to utilize more than one ring. Furthermore, as noted above, demand is far more variable and unstable in a universe of three- or four-node rings than in a universe of six-node rings. To avoid outages and other service problems due to unexpected demand peaks, engineers try to provide increased spare capacity so that they do not have to route circuits through multiple rings to avoid a congested ring. Though Verizon has not performed a detailed study of the fill in such a network, current experience suggests that an average fill of 36 DS3s per ring is achieved when the average ring size is between three and four nodes.

An average ring size of four nodes also would greatly increase the probability of DS3 circuits needing to use several rings to complete the connection between two nodes. The current Verizon study assumes that an extremely low average of 0.15 ring interconnections are used by each DS3. This assumption is very conservative even for a forward-looking local SONET architecture for Massachusetts, as assumed in the Verizon study, that employs a two-level ring architecture. In a two-level architecture, offices in a local cluster are connected by a local ring. This local ring also connects to a "hub" office that serves as an interconnection point for DS3 circuits that need to travel between local clusters. The hub offices are interconnected by a second level of SONET rings. In this architecture, DS3 circuits between offices on a local cluster stay on the local ring and thus require no ring interconnection resources. Any DS3 circuit between clusters must route through the hub office and experience one or more ring interconnections: one if the cluster it routes to is served by the same hub, two or more if the DS3 must route through another hub. A conservative estimate is that "inter-cluster" DS3's will experience, on average, two interconnections. Therefore to achieve an average of 0.15 interconnections per DS3, 92.5% of all DS3s must stay within their local cluster.[26] This is an extremely conservative estimate, even for an architecture with six nodes per ring. In an architecture with only four nodes per ring, the probability of connecting on a local ring would be very small, and the probability of requiring more than two interconnections would be large. Thus, if the four node per ring assumption were adopted as recommended by the CLEC Recurring Cost Panel, the ring interconnection factor would have to be increased to at least two. Increasing the number of interconnections in the IOF model would, in turn, increase IOF costs.

[26] If inter-cluster circuits experience an average of two interconnections, and 7.5% of circuits were inter-cluster circuits, the average number of interconnections across all circuits would equal 2 X 0.75 = 0.15. The remaining 92.5% of circuits would stay within their local cluster.

Q. Why did Verizon MA use the actual number of nodes per SONET ring and not the forward-looking number of nodes per ring when calculating the mileage-sensitive component of IOF UNE rates?

A. Verizon MA used the actual number of nodes per ring to reflect the conservative assumption that, in a forward-looking network, the actual length of Verizon MA's SONET rings would not change -- or change much -- even as additional nodes were added. Because Verizon MA does not maintain data concerning the average total length of existing rings, it was necessary to determine the average length of a ring using other data. The most readily available source of data was the average distance between nodes in the existing network, which could be multiplied by the average number of nodes on deployed rings in the existing network to determine the average length of a ring. It is in this calculation, estimating ring length for purposes of determining the mileage-sensitive component of the IOF UNE rates, that Verizon MA used the 3.83 node figure. In reality, as additional nodes are added to existing rings to make entry and exit more efficient, the length of rings would likely increase at least to some degree, because additional nodes cannot always be added precisely on existing fiber routes. Nevertheless, Verizon MA made the conservative assumption that, in a forward-looking network, the average length of each SONET ring would not increase from existing lengths.

Q. What effect would it have on Verizon MA's IOF UNE rates if the number of nodes per ring were increased to six in the mileage-sensitive calculations?

A. Naturally, increasing the number of nodes per ring in the mileage-sensitive calculations would increase the mileage-sensitive costs, unless the average distance between nodes were reduced by a corresponding percentage. By using the actual number of nodes per ring when calculating the mileage-sensitive component, Verizon MA avoided overstating mileage-sensitive costs.

B. Unbundled Digital Cross Connect System Port

Q. What is a Digital Cross Connect System (DCS)?

A. A DCS is a sophisticated, software driven network element that provides advanced circuit aggregation and management functions within the transport network. There are several types of DCS categorized by the functionality of the core cross-connection matrix of the system. A Narrowband DCS has a DS0 cross-connection capability, it cross-connects DS0 channels from one DS1 system to another. A NDCS typically has DS1 physical ports on it. A Wideband DCS has a DS1 cross-connection capability, it connects DS1 channels from one DS3 system to another. A WDCS can have DS1 and DS3 ports. Because the WDCS can connect a DS1 port to a DS1 channel within a DS3 port, the WDCS can provide a 1/3 multiplexing function. A Broadband DCS has a DS3 (or STS1 its SONET counterpart) cross-connection capability, it connects one DS3 (STS1) channel from one higher capacity system to another. Currently available BDCS have only DS3 (STS1) ports. DCS provide many operational and management functions. Most basically, they provide an efficient mechanism to interconnect with and among high capacity transport systems. This includes both physically connecting channels and aggregating channels to increase utilization. The systems also provide fault isolation and testing capabilities. Because DCS are remotely controlled by network management systems, they allow automated connection and rearrangement of circuits in connection with both service provisioning and restoration. NDCS and WDCS are usually deployed at a large central office and primarily support circuits that terminate in that office. BDCS are usually deployed at large transport hub offices and primarily support interconnections among very high capacity backbone transport systems, particularly SONET rings.

Q. Is Mr. Turner correct in saying that DCS functionality can be separated from dedicated transport?

A. No. The functionality provided by DCS in the forward looking Verizon MA architecture for dedicated transport are inherent to the efficient provision of the dedicated transport UNE. Mr. Turner bases his assertion on the totally irrelevant fact that the ports of the DCS are cabled to other transport elements through a physical connection frame. Every element and system in an efficient network are connected in this manner. The issue is not whether the DCS hypothetically could be removed from the architecture. It clearly could be. Rather, the issue is whether the dedicated transport UNEs can be provided at the same efficient cost developed in the Verizon study without the DCS functionality. This is not the case. As described earlier, the DCS supplies numerous functions essential to the delivery of dedicated transport channels across the network. Without the DCS these functions would still have to be performed but through inefficient, manual processes. The grooming and aggregation functions provided by the DCS would be completely lost resulting in lower channel fill on the high capacity transport facilities. The overall effect would be to increase the cost of the dedicated UNE elements above those calculated in the model assuming DCS.

Q. But isn't Mr. Turner correct in concluding that since Verizon MA offers access to DCS on a tariff basis the cost should not be included in the dedicated transport study?

A No. Mr. Turner points to a particular Verizon service (Enterprise Network Reconfiguration Service (ENRS)) that utilizes a limited set of DCS functionality to provide specific circuit rearrangement services. While this service uses capacity on some of the same DCS elements that support the dedicated transport services, the applications are completely different. Furthermore, the fact that certain capabilities of DCS can be used to develop a particular retail service has no bearing as to whether or not DCS is an inherent and essential component of efficient dedicated transport UNEs.

C. Transmission Equipment In-Place Factor

Q. Mr. Turner, on page 14 asserts that Verizon MA's use of a 53.2% in-place (EF&I) factor for transport transmission equipment is too high, and states that in its experience the correct factor should be in the range of 30%. Is this appropriate?

A. Not surprisingly, while claiming that his experience shows that the EF&I factor should be in the 30% range, Mr. Turner provides no evidence or even a frame of reference to support or give any context to this figure. For example, it is not even clear whether, as is the case with their other EF&I proposals (such as digital switching), AT&T is seeking to rely on figures that are almost 10 years old. It is similarly not clear whether this figure relates to a network in Massachusetts. In fact, parsing the sentence carefully, it is not even clear that AT&T is claiming that an EF&I of 30% for transport transmission equipment actually exists -- just that it *should*, in AT&T's view.

In contrast, Verizon MA's EF&I factors are based on the company's actual experience in 1998, using the discounted material prices at that time and the actual installed equipment. Such data is certain to be more relevant and more accurate than what AT&T proposes with respect to an unidentified network, an unspecified era, and a nameless geographic location. Indeed, Verizon MA's own EF&I experience is more reflective of what Verizon MA should expect going forward than some other company's alleged experience or preference.

Q. Please comment on Mr. Turner contention that the 53.2% EF&I for Massachusetts must be too high, because the one Verizon used in its New York UNE proceeding was only 36.4%.

A. The EF&I factor that Verizon used in its New York UNE proceeding was based on equipment placed in 1997. As noted, the Massachusetts EF&I is based on equipment placed in 1998. As explained in the Panel Direct and in this testimony, when equipment prices decrease, as they may to do year by year, the EF&I factor gets higher, to reflect the fact that the installation costs (which do not decrease simply because the equipment price has decreased) are likely to constitute a greater percentage of the overall installed material investment. If AT&T wishes to use the lower EF&I factor from the New York proceeding, they should be prepared, as well, to use the architecture and price lists of the transport transmission equipment installed in 1997. It would otherwise be entirely unreasonable to simply substitute the lower 1997-based EF&I factor in these cost studies.

D. IEC POP Error

Q. AT&T/WorldCom alleges that the IOF Transport cost model should be run in the InterLATA option to develop costs associated with UNE IOF. (Turner at 16). Do you agree?

A. Yes. Verizon has re-ran the model using the IntraLATA option and the study results are being filed with this testimony.

E. Verizon MA's Weighted Average Distance Between Wire Centers is Correct

Q. AT&T/WorldCom claim that Verizon MA's overstated the weighted average distance between its wire centers in developing the cost for Common Transport. [Turner at 18.] Do you agree?

A. Absolutely not. Mr. Turner criticizes the methodology Verizon MA used to develop the average miles, yet he admits he has no knowledge on precisely how Verizon MA developed its methodology.[27] Had AT&T/WorldCom requested the mileage calculation analysis during discovery, Verizon MA would have provided the information, thereby eliminating Mr. Turner's apparent post-discovery confusion. Had Mr. Turner sought Verizon's analysis it is unlikely that he would be proposing a totally arbitrary "12 miles" recommendation.

Q. Can you explain how Verizon MA determined the average miles used to develop the Common Transport MOU costs?

A. Yes. Verizon MA developed the average miles by examining the actual mileage of every local and toll circuit in Massachusetts.

VII. DARK FIBER

[27] Turner at 20.

A. Verizon MA's Dark Fiber Costs Produce Reasonable Cost Estimates And Do Not Result In Over-Recovery

Q. Mr. Donovan claims that Verizon counts the fiber cable and supporting structures supporting the cable twice, and therefore over-recovers its costs. Is he correct?

A. No. Mr. Donovan's assertions are based on a complete misunderstanding of Verizon MA's cost studies, particularly the development and use of utilization factors.

Q. Please explain in more detail.

A. First, Mr. Donovan assumes that the utilization factors used in Verizon MA's loop studies are based only on "normal POTS and special services demand." (Donovan Rebuttal at 46). This is not the case. Verizon has not testified that it considers only normal POTS and special services demand in its utilization factors. As discussed earlier, Verizon considers all known and potential demand when sizing fiber cables. Thus, Mr. Donovan's assumption is not correct.

Mr. Donovan then goes on to suggest on page 48 that Verizon applies the utilization factor a second time, creating an additional over-recovery. In this case Mr. Donovan simply does not understand Verizon MA's cost workpapers. Verizon MA does indeed use the same utilization factor in both the Loop studies and the Dark Fiber studies. However, the utilization factor is only applied to the investment once. Mr. Donovan's assertion is clearly wrong.

Q. Should, as Mr. Donovan suggests, Verizon use a 100% utilization factor for Dark Fiber?

A. No. The issue of 100% fill in the feeder portion of the loop was addressed in detail earlier in this surrebuttal testimony.

VIII. HOUSE AND RISER

A. House and Riser Design

Q. AT&T/WorldCom claims (Donovan at 32) that Verizon's House and Riser Cable design is confusing, complex, and inefficient. They also claim that Verizon's design violates past Department rulings. Are they correct?

A. No. Mr. Donovan misrepresents Verizon MA's proposal in this proceeding. The design proposed by Verizon MA is the same design approved by the Department in earlier proceedings. Mr. Donovan is correct that the Department did rule that Verizon may not force the CLEC to pay for a backboard and terminal block. What the Department has ruled is that the arrangement is optional, and that is exactly what Verizon MA is proposing in this case. A review of the Massachusetts Wholesale Tariff (DTE MA No. 17, Part B, Section 12, Page 3) clearly shows that Verizon MA has complied with the Department's ruling and our proposal here is fully compliant with the tariff.

B. House and Riser Fill Factors

Q. Are the witnesses testifying on behalf of AT&T and WorldCom correct in claiming that the appropriate forward-looking fill for house and riser cable is 64.1% and 75% as Dr. Ankum claims on behalf of the CLEC Coalition?

A. No. House and riser cable is basically distribution cable in a building. The principles used to design house and riser are the same design considerations used when sizing distribution cables. Again, one of the primary reasons that an engineer uses ultimate demand requirements for sizing house and riser is cost. Significant costs and major disruptions causing customer dissatisfaction occur when reinforcing or rearranging house and riser cable. When a new building is being constructed, the engineer typically negotiates space in the building to terminate facilities and a path for the cable. Building owners must provide backboards, holes between floors, and conduit to allow for Verizon to place house and riser facilities. Once the building is complete and the walls are closed in, the cost to reinforce an undersized cable increases dramatically. The distances in a building are short. The cost of material pales in comparison to the cost of rework and reinforcement.

C. AT&T/WorldCom's Proposed Horizontal House and Riser Study is Unrealistic and Should Not be Accepted

Q. AT&T/WorldCom (Donovan Rebuttal at 37) claims that the primary difference between their cost study and Verizon MA's cost study is the material and labor costs associated with installing a terminal. Is there any validity to their claim?

A. AT&T/WorldCom's proposed study is nothing more than a very weak attempt to lower the rates for Horizontal House and Riser. Mr. Donovan has presented very little evidence to support his study other than references to FCC inputs in an unrelated proceeding. Furthermore, Mr. Donovan's study is misleading and lacking in several important details that would make AT&T/WorldCom's study comparable to Verizon MA's study.

Q. Please explain your concerns regarding the lack of specific information in Mr. Donovan's study.

A. Mr. Donovan's study of terminal costs is based on five major work activities:

- Travel time between floors and placement of terminal block.
- Place backboard.
- Pair termination
- Place Cable Stub
- Splice Pairs

For the first activity, Mr. Donovan assumes five minutes of travel time between floors and one minute to place the terminal block. Also included is the investment in the terminal block itself. Even if we accept the FCC labor inputs, a very important question needs to be answered. How did the technician get to the building in order to perform the work? Apparently Mr. Donovan assumes that Verizon has a technician stationed permanently at each building since he did not include any travel time for the technician to get there and return.

The second activity includes five minutes to place a backboard, but does not include any cost for the backboard itself.

The fourth activity includes the labor associated with placing the cable stub. As with the backboard discussed above, there appears to be no material cost.

Also completely missing from Mr. Donovan's study are any costs associated with the labor associated with engineering the job and purchasing the material. Based on these shortcomings, Mr. Donovan's study should not even be considered by the Department in this proceeding.

Q. Mr. Donovan also criticizes Verizon's use of a 150 foot average length for horizontal cable. He recommends using a length of 91 feet based on a sample survey conducted by AT&T. Please comment on this recommendation.

A. As with his other recommendations, Mr. Donovan has not provided sufficient information to allow a complete analysis. For example, it is unclear whether his sample represents only residential buildings, business locations, or a mix of both. In response to a data request (VZ-ATT/WC 1-34), Mr. Donovan only states that the survey was conducted by AT&T's Broadband affiliate. It is even unclear whether the sampled locations are all buildings that contain horizontal wiring owned by Verizon. The Verizon study, on the other hand, is based on an estimate provide by Verizon personnel with actual experience placing these types of cables. Clearly the Verizon study is more reliable.

Q. Do you have any other comments regarding AT&T/WorldCom's Horizontal Cable study?

A. Mr. Donovan discusses only the average length issue. What he fails to mention is the fact that AT&T/WorldCom's proposed cable investment is actually more than twice the amount proposed by Verizon on a per foot basis. Thus it is reasonable to conclude that if Verizon were to charge on a per foot basis rather than on an average length basis, Mr. Donovan would not object to the higher rate.

IX. ONGOING OSS COSTS

Q. What is the purpose of this section of the recurring panel testimony?

A. The purpose of this section is to address two adjustments made in Mr. Baranowski's Rebuttal Testimony relating to the Company's Access to Operations Support Systems ("OSS") cost study.

Q. Do you agree with Mr. Baranowski's claim that estimated year 2002 computer investment costs should be reduced to 50% of the 1999 levels?

A. No. Verizon incurred significant expenditures between 1996 and 1999 in computer hardware to enable CLEC and Reseller access to OSS. By the end of 1999, this UNE was available to these telecommunications carriers and has been providing the required access. Although Verizon MA incurred these costs in 1996 through 1999, the cost study reflects the 1999 cost for this mainframe computer equipment, which is lower than the costs Verizon incurred in 1996-98. Mr. Baranowski's claim that Verizon MA should further reduce these costs should be rejected. Indeed, under Mr. Baranowski's theory, the investment associated with this would approach zero. This approach, of course, is clearly without merit.

Verizon MA's OSS cost study appropriately reflects the forward-looking costs that the Company, as an efficient provider, actually expects to incur in providing the UNE. As a result, further adjustments to the Computer investments are not warranted.

Q. Does Mr. Baranowski have any support for the 50% figure that he quotes for making his reduction?

A. No. Although Mr. Baranowski's statements about the experiences from 1996 to 1999 are true (that is the cost per MIPS has declined by 60% from $25,000 to $10,000 and the cost per GIG has declined by 80% from $3,000 to $600), this trend has since significantly stabilized. Currently the cost per MIPS is $9,800, which represents only a 2% decline from 1999 levels. Currently, the cost per GIG is $420, which represents a 30% decline from the 1999 levels. Thus, Mr. Baranowski's extrapolations based on 1996 to 1999 substantially overstate the current decline in the cost of computer hardware.

Q. Mr. Baranowski also makes a 50% reduction in the access to OSS software maintenance costs. He bases this on a prior Department determination that the Company also benefits through improved operating efficiency from improvements to OSS as a result of the work activity undertaken to provide access to OSS. Is his reduction appropriate?

A. No. The Company continues to disagree with that prior determination, which was based on the pure speculation of AT&T witness Dr. Selwyn. Verizon MA produced volumes of documentation and testimony that demonstrates that Verizon MA's proposed OSS costs only reflect the work associated with creating the interfaces and systems that permit the CLECs to access Verizon MA's OSS. Verizon does not use or benefit from any of these changes which were made exclusively to accommodate CLECs. Mr. Baranowski's 50% reduction should be rejected.

Q. Does this conclude your testimony?

A. Yes.

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COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

D.T.E. 01-20 (Part A)

SURREBUTTAL TESTIMONY OF DR. JOHN M. LACEY

ON BEHALF OF VERIZON NEW ENGLAND INC.

d/b/a VERIZON MASSACHUSETTS

DECEMBER 17, 2001

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I. INTRODUCTION

Q. What is your name and address?

A. My name is Dr. John M. Lacey. I am Professor of Accountancy and Ernst & Young Research Fellow at California State University, Long Beach. My address is 7 Poppy Trail, Rolling Hills, CA 90274.

Q. Please describe your educational background and academic and professional experience.

A. I earned my Ph.D. at UCLA, with a major in accounting information systems and minors in economics and mathematics. I earned an MBA with a major in quantitative business analysis and a Bachelor of Science in accounting at the University of Southern California (USC). I previously taught at the Leventhal School of Accounting at USC and at the Anderson Graduate School of Management at UCLA. While at USC, I served on the Telecommunications MBA Program faculty and taught in the Telecommunications Executive Program. I am a CPA.

I have served on the Accounting Standards Executive Committee of the American Institute of Certified Public Accountants (AICPA) and chaired its Participating Mortgages Task Force and International Accounting Standards Task Force. I also served as Chair of the AICPA Real Estate Committee and its Accounting and Auditing Guide Task Force. I currently serve on the AICPA Continuing Professional Education Committee, chair the California Society of